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Zhang

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(54) **ELECTRICAL CONNECTOR HAVING CONTACT WITH HIGH CONTACT NORMAL FORCE AND SUFFICIENT RESILIENCY**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**[7] **H01R 33/00**
(52) **U.S. Cl.** **439/660**; 439/74
(58) **Field of Search** 439/660, 74, 637, 439/676

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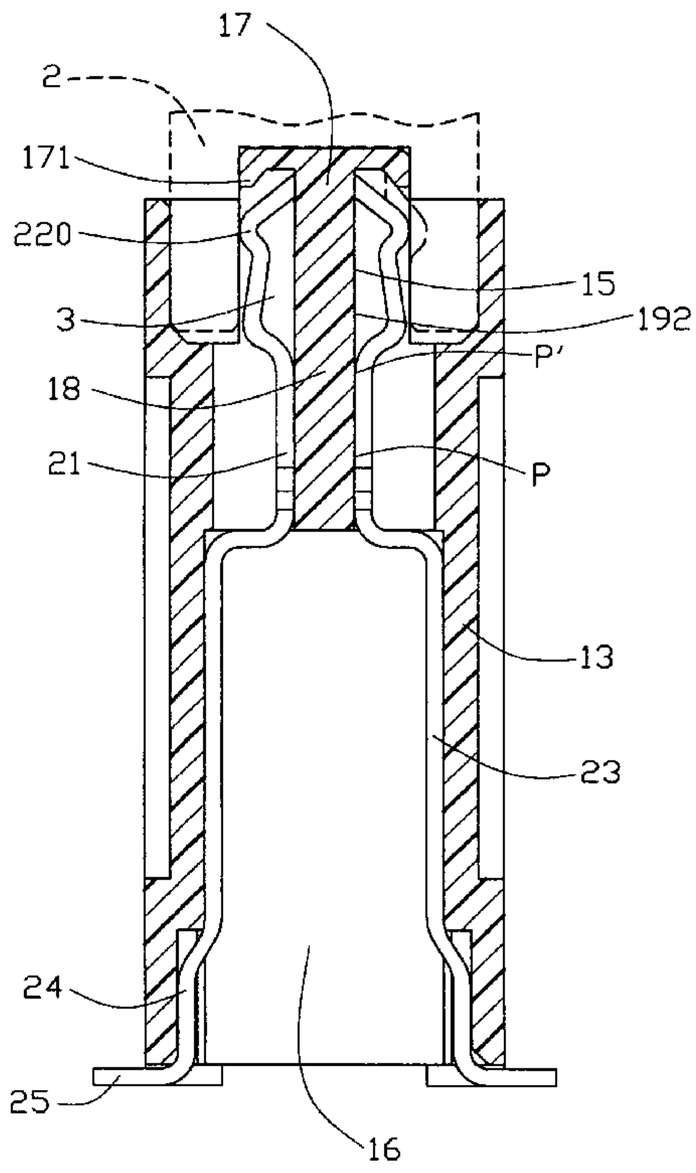
(57) **ABSTRACT**

An electrical connector includes a dielectric housing and a terminal. The dielectric housing includes a mating surface, a mating space in the mating surface, a passageway communicating with the mating space and having an inner face, and a stopper extending into the passageway. The terminal is received in the passageway and comprises an intermediate beam having a fulcrum contacting with the inner face of the passageway and a spring arm extending curvedly from the intermediate beam. The spring arm has a contact portion extending into the mating space and a tab abutting against the stopper for being pre-stressed. The intermediate beam and the inner face of the passageway define an elongated slit therebetween. The spring arm and the inner face of the passageway define a resilient room therebetween communicating with the elongated slit. The contact portion is movable toward the inner face of the passageway to cause the fulcrum moving toward the spring arm.

6 Claims, 4 Drawing Sheets



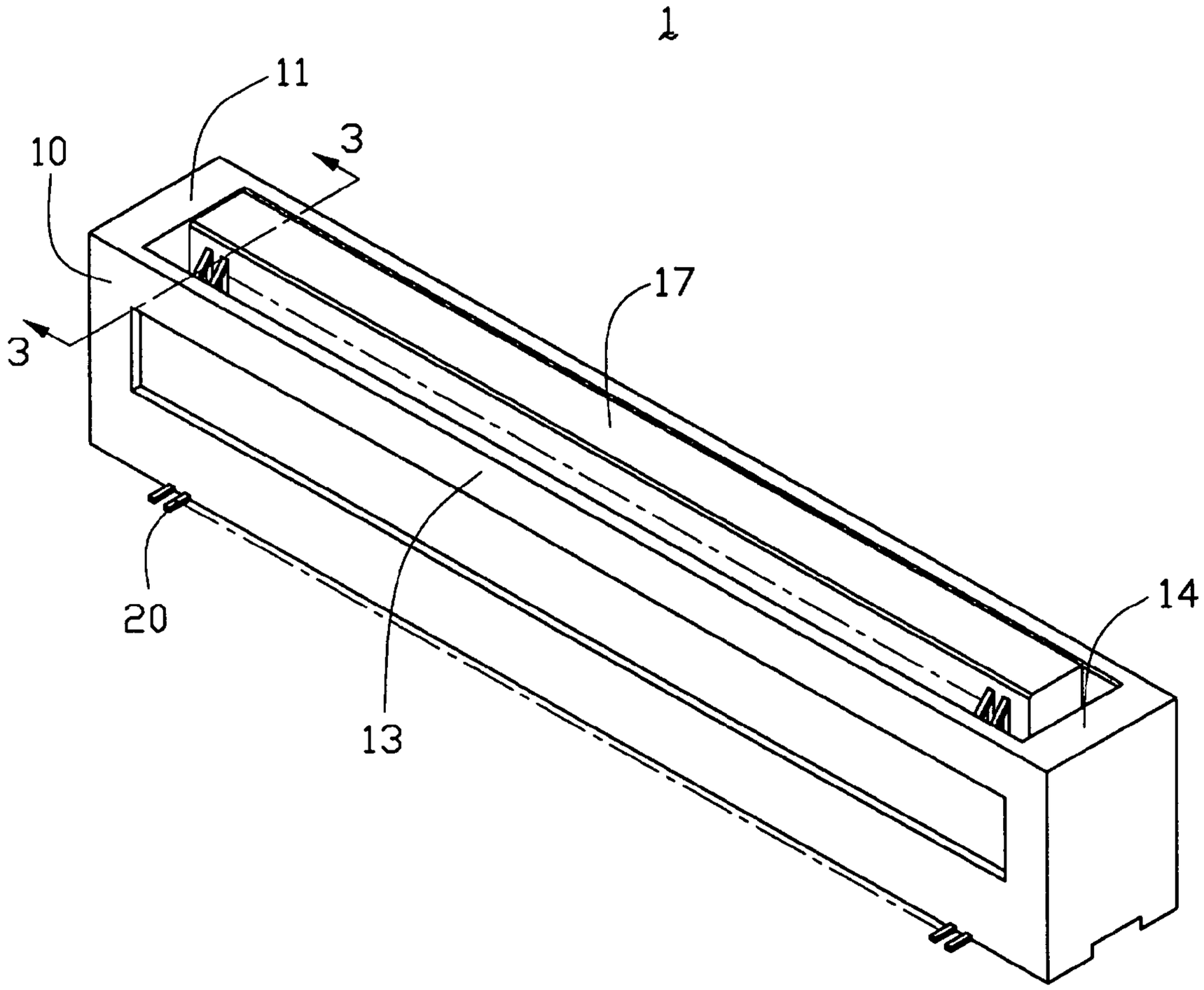


FIG. 1

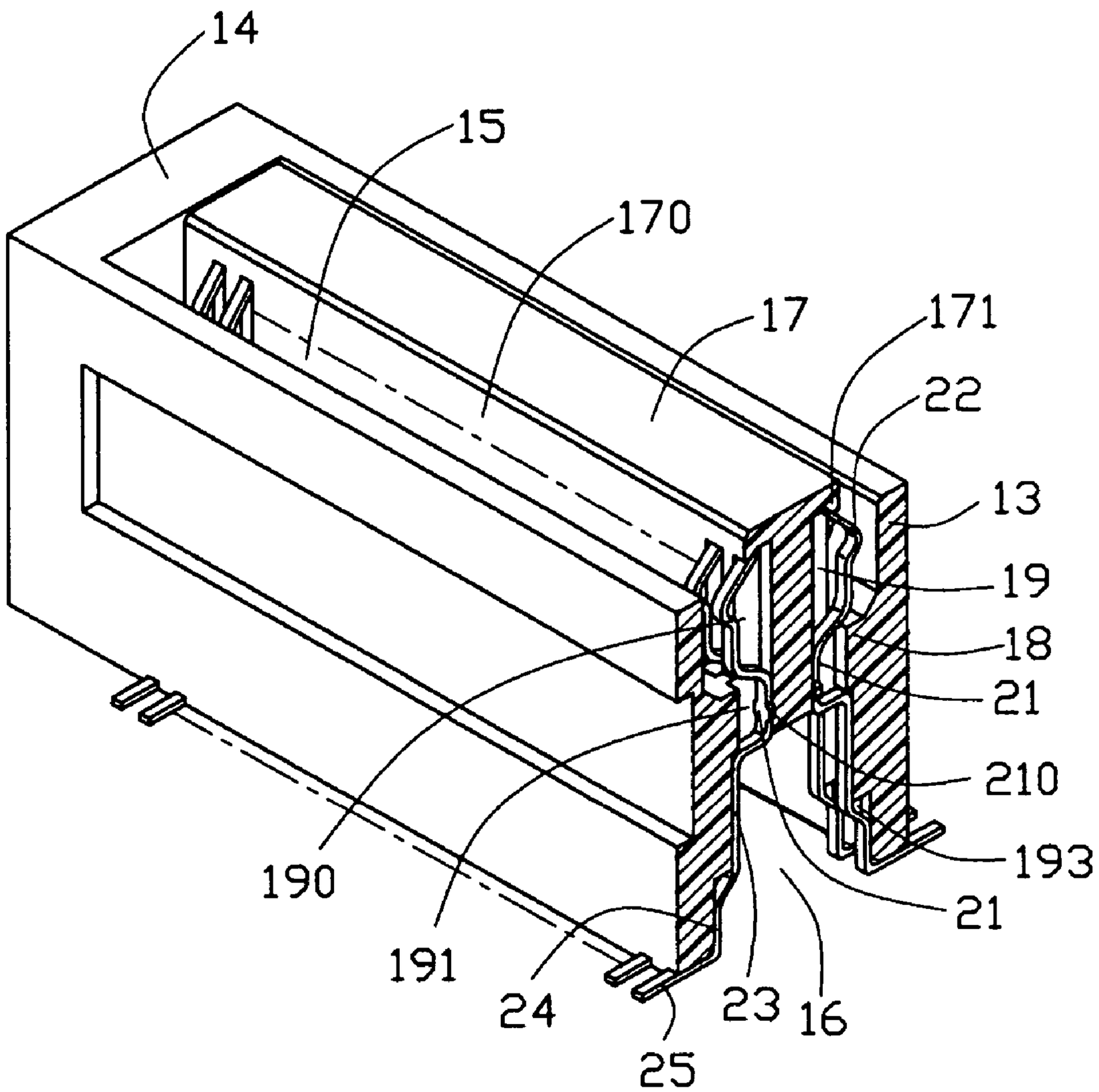


FIG. 2

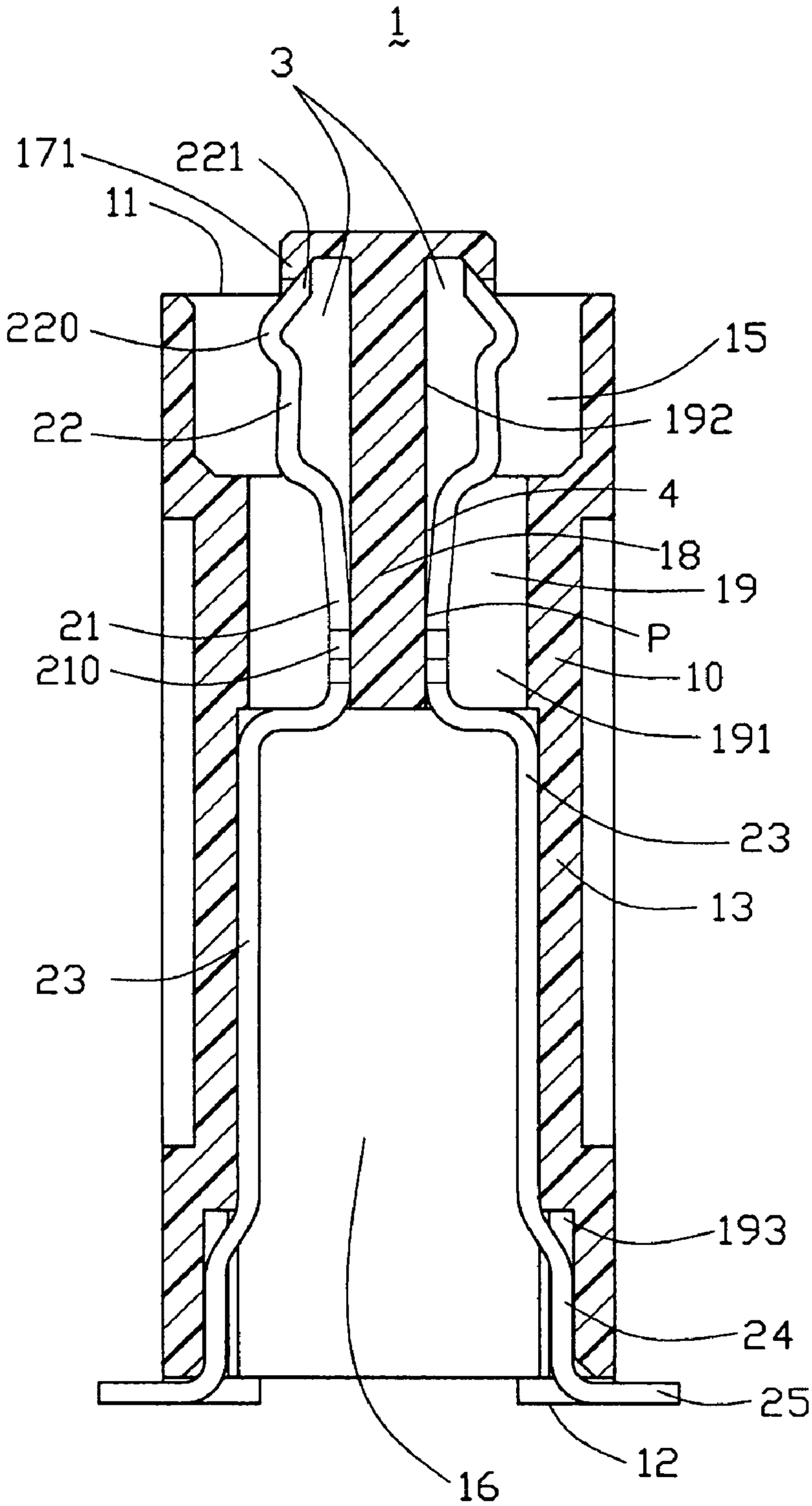

1
3
171
221
11
220
15
22
192
4
18
19
21
P
210
10
191
23
13
23
193
24
25
12
16

FIG. 3

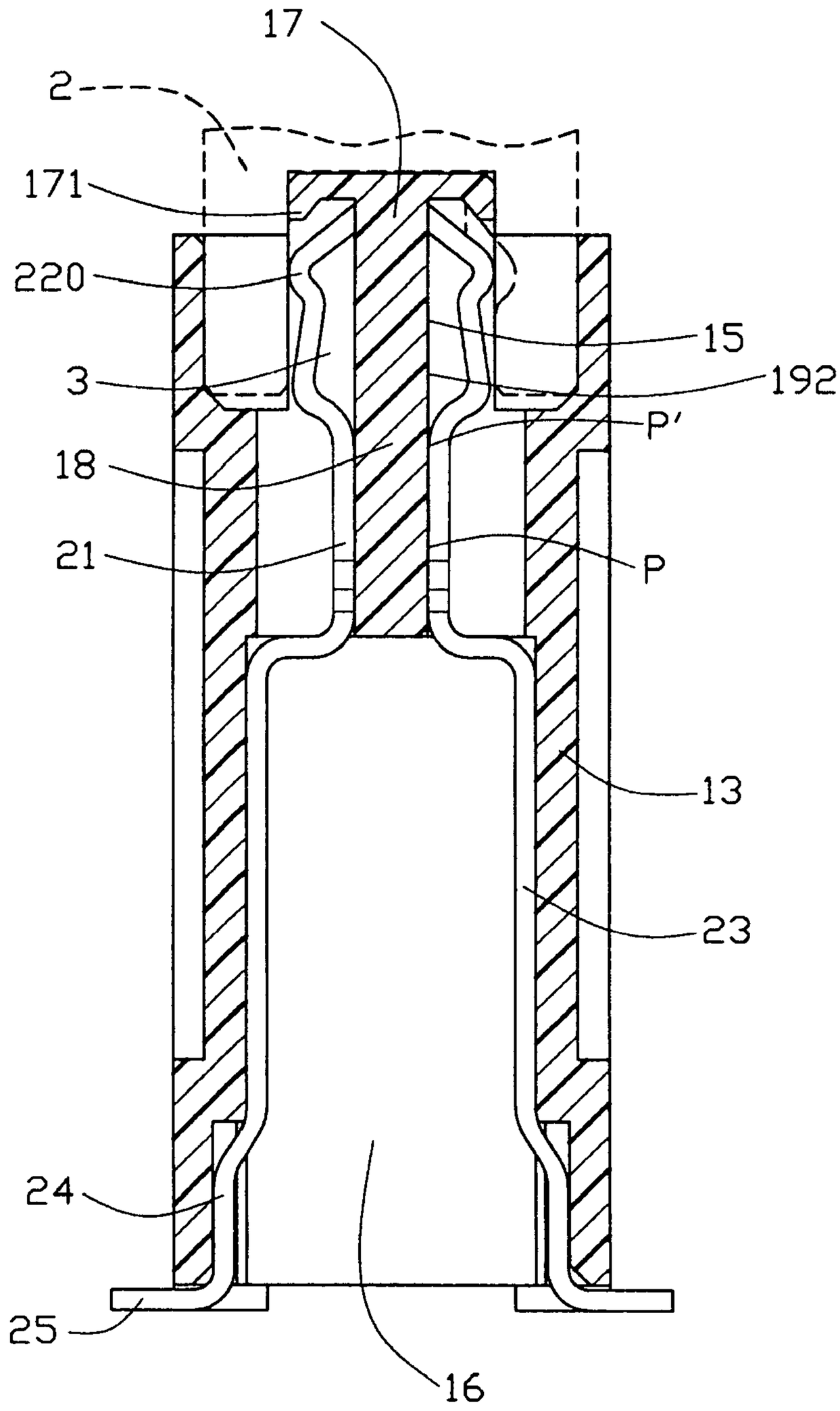


FIG. 4

ELECTRICAL CONNECTOR HAVING CONTACT WITH HIGH CONTACT NORMAL FORCE AND SUFFICIENT RESILIENCY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electrical connector, and more particularly to board-to-board having a plurality of terminals with high contact normal force and sufficient resiliency.

2. Description of Related Art

Board-to-Board connector assembly generally includes a plug and a receptacle connectors respectively mounted on two parallelly spaced printed circuit boards (PCB) and mated with each other for mechanical and electrical interconnection therebetween, whereby the corresponding printed circuit boards can be electrically connected with each other for signal transmission.

The plug and the receptacle respectively comprise a plurality of terminals to establish an electrical and mechanical connection therebetween. It is well know that a high enough mating force is required between the terminals of the plug and the terminals of the receptacle for ensuring reliable signal transmission between the plug and receptacle. In order to increase the mating force, the receptacle generally provides an enough space for sufficient elastic deflection of the terminals. This conflicts with the continuing trend of the connector toward miniaturization. U.S. Pat. No. 5,797,770 discloses another solution to improve mating force of a receptacle by providing a plurality of pre-stress terminals. However, repeated engagement between the plug and the receptacle may wear out the terminals of the receptacle due to the pre-stress terminals having high mating force.

Hence, a receptacle connector with improved contacts is desired to overcome the disadvantage of the prior art.

SUMMARY OF THE INVENTION

An object of the present invention is to provide an electrical connector with a plurality of improved terminals with high contact normal force for ensuring a reliable connection with a complementary connector.

To achieve the above object, an electrical connector includes a dielectric housing and a terminal. The dielectric housing includes a mating surface, a mating space in the mating surface, a passageway communicating with the mating space and having an inner face, and a stopper extending into the passageway. The terminal is received in the passageway and comprises an intermediate beam having a fulcrum contacting with the inner face of the passageway and a spring arm extending curvedly from the intermediate beam. The spring arm has a contact portion extending into the mating space and a tab abutting against the stopper for being pre-stressed. The intermediate beam and the inner face of the passageway define an elongated slit therebetween from the fulcrum. The spring arm and the inner face of the passageway define a resilient room therebetween communicating with the elongated slit. The contact portion is movable toward the inner face of the passageway to cause the fulcrum moving toward the spring arm.

Other objects, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an assembled perspective view of an electrical connector in accordance with the present invention;

FIG. **2** is an enlarged fragmentary perspective, cross-sectional view of the electrical connector shown in FIG. **1**;

FIG. **3** is a cross-sectional view of the electrical connector taken along line **3**—**3** of FIG. **1**; and

FIG. **4** is a view similar to FIG. **4**, but showing a state of the electrical connector after engaging with a complementary connector.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. **1** and **4**, an electrical connector **1** in accordance with the present invention for engaging with a complementary connector **2** comprises an elongate dielectric housing **10** and a plurality of terminals **20** received in the dielectric housing **10**.

Referring to FIGS. **2** and **3**, the dielectric housing **10** has a mating surface **11** and a mounting surface **12** opposite to the mating surface **11**. Laterally spaced opposite side walls **13** and longitudinally spaced opposite end walls **14** extend between the mating surface **11** and the mounting surface **12**, respectively. The dielectric housing **10** comprises a mating space **15** in the mating surface **11** between the side walls **13**, a cavity **16** in the mounting surface **12** between the side walls **13**, and a clapboard **18** formed between the mating space **15** and the cavity **16** and interconnecting with the side walls **13** and the end walls **14**. The dielectric housing **10** is formed with a mating portion **17** extending beyond the mating surface **11** from the clapboard **18** and located in the mating space **15**.

As best shown in FIG. **2**, the dielectric housing **10** defines a plurality of passageways **19**. Each passageway **19** comprises a recess **190** defined in a side face **170** of the mating portion **17** and communicating with the mating space **15**, a channel **191** extending downwardly from the recess **190** and passing through the clapboard **18** and an inner face **192** facing the recess **190** and the channel **191**. The mating portion **17** is formed with a plurality of stoppers **171** extending into corresponding recesses **190**, respectively. Each passageway **19** further comprises a cutout **193** defined in an inner face of the side wall **13** and adjacent the mounting surface **12**.

Referring to FIGS. **3** and **4**, the terminals **20** is received in corresponding passageways **19** of the housing **10** and each comprise an intermediate beam **21**, a spring arm **22** extending curvedly and upwardly from one end of the intermediate beam **21**, a connecting beam **23** extending downwardly from the other end of the intermediate beam **21** and a retaining leg **24** extending downwardly from the connecting beam **23**. The intermediate beam **21** is formed with a pair of barbs **210** adjacent to the connecting beam **23**. The spring arm **22** comprises a curved contact portion **220** and a tab **221** at a free end thereof. The terminal **20** further comprises a solder tail **25** perpendicularly extending from the retaining leg **24** for being surface mounting onto a printed circuit board (not shown).

Referring to FIGS. **3** and **4**, the terminals **20** are inserted into the dielectric housing **10** from the mounting face **12**. The intermediate beams **21** are retained in the channels **191** with the barbs **210** interferentially engaging with the dielectric housing **10** for securing the terminals **20** to the housing **10**. The spring arms **22** are movably received in the recesses **190** with the tabs **221** abutting against the stoppers **171** of

the mating portion **17** for pre-stressing the terminals **20** to increase a mating force between the terminal **20** of the electrical connector **1** and a corresponding terminal of the complementary connector **2**. The contact portions **220** of the spring arms **22** extend into the mating space **15**. The connecting beams **23** are attached to the inner faces of the side walls **13** and the retaining legs **24** are retained in the cutouts **24** for further securing the terminals **20** to the dielectric housing **10**.

A room **3** is defined between the spring portion **22** and the inner face **192** of the passageway **19** for the spring arm **22** to deflect. The intermediate beam **21** has a first fulcrum P located above the barbs **210** and contacting with the inner face **192** of the passageway **19**. An elongated slit **4** is defined between the intermediate beam **21** and the inner face **192** of the passageway **19** and communicates with the room **3**. A distance between the first fulcrum P and the contact portion **220** is larger than that of a conventional connector. Thus, the spring portion **22** of the terminal has a better elasticity and is not easy to be wore out during repeated engagement with the complementary connector **2**.

Referring to FIG. **4**, when the electrical connector **1** in accordance with the present invention engages with the complementary connector **2**, a mating portion of the complementary connector **2** is received in the mating space **15**. The contact portion **220** is pressed to deflect the spring arm **22** toward the inner face **192** of the passageway **19**, a second fulcrum P' of the intermediate beam **21** is accordingly formed and located above the first fulcrum P. A distance between the contact portion **220** and the second fulcrum P' is equal to or smaller than that of the convention connector, whereby the spring arm **22** having an enough high elastic coefficient. Therefore, the electrical connector has a mating force high enough to ensure a reliable connection with the complementary connector. It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size, and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

What is claimed is:

1. An electrical connector comprising:

a dielectric housing comprising a mating surface, a mating space in the mating surface, a passageway communicating with the mating space and having an inner face, and a stopper extending into the passageway;

a terminal received in the passageway and comprising an intermediate beam having a fulcrum contacting with the inner face of the passageway and a spring arm extending curvedly from the intermediate beam, the spring arm having a contact portion extending into the mating space and a tab abutting against the stopper for being pre-stressed, the intermediate beam and the inner face of the passageway defining an elongated slit therebetween, the spring arm and the inner face of the passageway defining a room therebetween communicating with the elongated slit, the contact portion being movable toward the inner face of the passageway to cause the fulcrum moving toward the spring arm.

2. The electrical connector as claimed in claim **1**, wherein the dielectric housing comprises a mating portion extending beyond the mating surface and located in the mating space, and wherein the passageway is defined on the mating portion.

3. The electrical connector as claimed in claim **1**, wherein the intermediate beam is formed with a barb interferentially engaging with the dielectric housing.

4. The electrical connector as claimed in claim **1**, wherein the terminal further comprises a connecting beam extending from the intermediate beam, a retaining leg extending from the intermediate beam and a solder tail extending from the retaining leg for being surface mounted onto a printed circuit board.

5. An electrical connector comprising:

an insulative housing defining a plurality of passageways, each of said passageways defining an innermost face and an outermost stopper;

a plurality of contacts received in the corresponding passageways, respectively, each of said contacts defining a retention portion abutting against the inner face, a tip abutting against the stopper in an un-mating condition of the connector so as to have the contact in a preloaded manner, a spring arm and an intermediate portion connected to said retention portion and said tip, respectively, and further connected to each other; wherein

a first fulcrum is located between the retention portion and the intermediate portion for functioning in the un-mating condition of the connector, and a second fulcrum is located between the intermediate portion and the spring arm for functioning in a mating condition of the connector.

6. The electrical connector as claimed in claim **5**, wherein said intermediate portion is slightly spaced from the inner face in said un-mating condition while abutting against the inner face in said mating condition.

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